National Science Bowl®
Saturday Seminars

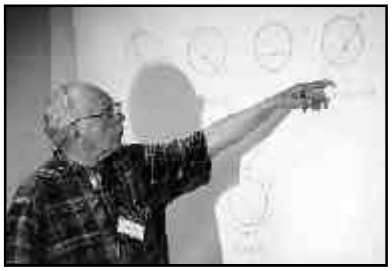
May 5, 2001
National 4-H Conference Center
Chevy Chase, MD

Seminars by Times and Locations

Room	Session I 9:00 - 10:15 a.m.
Colorado	*Plasma Teacher Workshop* *Dr. Andrew Post-Zwicker & Ed Eckel*
Idaho	*Quantum Computers & Quantum Info. Theory* *Dr. John Smolin* *Facilitator: Dean Williams*
Illinois	*Plant Crystals - Useful Materials or Jewelry?* *Dr. Ezequiel Rivera* *Facilitator: Lilas Soukup*
Kentucky	*Robotic Systems for Exploring the Solar System* *Dr. David Lavery* *Facilitator: Ray Ng*
Louisiana	*Adventures in Neutron Activation Analysis* *Dr. Larry Robinson* *Facilitator: Bob Kuech*
Michigan	*Secret Lights in the Sea: Marine Bioluminescence* *Dr. Edith Widder* *Facilitator: Michael Ray*
Missouri	*What the Bones Tell Us* *Dr. Kevin Miller* *Facilitator: Kyra Stewart*
Ohio	*Searching for the Elusive Magnetic Lines of Force* *Paul Thomas "Mr. Magnet"* *Facilitator: Nannette Engelbrite*
Oklahoma A	*Hot Moons, Cold Comets, and a SHARP Way* *Jim Nations* *Facilitator: Steve Gagnon*
Washington	*Knots & Physics* *Dr. Louis Kauffman* *Facilitator: Steve Curtis*
Wisconsin	*Sequencing the Human Genome* *Dr. Eric Green* *Facilitator: Jeri Patient*

Session II
10:30 - 11:45 a.m.

Plasma Teacher Workshop
Dr. Andrew Post-Zwicker & Ed Eckel



Living Safely on a Dangerous Planet
Dr. Timothy Cohn
Facilitator: Rob Sanford

Plant Crystals - Materials or Jewelry?
Dr. Ezequiel Rivera
Facilitator: Jan Tyler

Robotic Systems for the Solar System
Dr. David Lavery
Facilitator: Steve Curtis

Embryo Preservation
Dr. John Dobrinsky
Facilitator: C.J. Armstrong

Secret Lights in the Sea
Dr. Edith Widder
Facilitator: Jeri Patient

What the Bones Tell Us
Dr. Kevin Miller
Facilitator: Tim Gerhart

Elusive Magnetic Lines of Force
Paul Thomas "Mr. Magnet"
Facilitator: Jo Ann Rochon

Hot Moons, Cold Comets
Jim Nations
Facilitator: Kathy Ketner

Knots & Physics
Dr. Louis Kauffman
Facilitator: Marty Harvill

The Infinite Future
Dr. Ravi Althale
Facilitator: Steve Gagnon

Need to Brush up for the Science Bowl Competition?

Choose any of the seminars that interest you on the previous pages for each session. If they all look good and you want to see which would benefit you in the competition, they are grouped below by National Science Bowl® question subject area.

Want to expand your ***Astronomy***? Observe pages 8 and 13.

Need to enliven your ***Biology***? Look at pages 10, 11, 15, or 17.

Inhibited on your ***Chemistry***? Read page 7 or 9.

Like to crunch on ***Computer Science***? Go to pages 6 and 18.

Want to shake up your ***Earth Science***? Cross examine page 16.

Have a ***Math*** problem? Spend your time on pages 6 and 14.

Need a lift on ***Physics***? Check out pages 12 and 14.

Question on ***General Science***? Go to all of them!

Good Luck!

The Beauty, Complexity, Subtlety, & Applications of Plasmas Workshop for Teachers

Dr. Andrew Post-Zwicker

& Ed Eckel

Colorado

9:00 - 11:45

Plasmas make up more than 99% of the visible universe and are considered the fourth state of matter. This hands-on workshop will allow participants to investigate the science and applications of plasmas, from the aurora borealis to fusion energy to computer chip manufacturing to toxic waste clean-up to satellite propulsion to fluorescent lighting. We will discuss methods to weave plasmas into existing curricula, from demonstrations to laboratory investigations, to advanced projects.

Andrew Post-Zwicker is the Lead Scientist in the Science Education Program of the Princeton Plasma Physics Laboratory. He holds a Ph.D. in Physics from Johns Hopkins University and a B.A. in Physics from Bard College. A plasma spectroscopist by training, he designs and teaches innovative methods of weaving plasmas into existing curricula at a variety of levels. In 1998 he created "Plasma Camp," an intensive summer workshop for high school teachers centered on plasmas and fusion energy. Andrew is the Secretary/Treasurer of the APS Forum on Physics and Society, a past member of the Executive Committee of the APS Forum on Education and the Founder of Scientists Advocating Fusion Energy Research (SAFER).

Ed Eckel earned his MS in Physics from University of Massachusetts-Amherst in 1993. He has been teaching for 6 years at independent schools in Massachusetts and Washington, D.C. Ed is currently at the Georgetown Day School, teaching physics and integrated 9th grade science. A participant at the Plasma Camp 2000 at Princeton with Mr. Post-Zwicker, Ed has developed high school activity based curriculum with the Insurance Institute for Highway Safety and with NASA Goddard. Ed works with the Smithsonian Office of Education as a Teacher-Partner helping to create and deliver museum-based professional development programs for teachers. Ed and his wife Laura share the joy of two young children.

Quantum Computers & Quantum Information Theory

Dr. John Smolin

Idaho
9:00 - 10:15

Ordinary, or classical information, is part of a larger subject, Quantum Information. Quantum theory is older than information and computation theory, dating from the early 20th century. It has been applied throughout physics, chemistry and engineering with enormous success, but until recently was not directly applied to information processing. Almost all information technology today involves classical information, but quantum information theory has potential in several areas, notably in cryptography, and in vastly speeding up certain otherwise impossibly-hard computations.

John Smolin is motivated mainly by an ambition to better understand the universe, and feels lucky to have been around at a time when the connections between information theory and physics are being understood. After helping build the first quantum cryptography experiment at IBM in 1989, he did his Ph.D. work jointly with UCLA and IBM and has been an IBM research staff member since 1998. When not working with his colleagues at IBM and elsewhere on physics of information, he likes tinkering with his cars, hacking on linux and exploring the relationship of computers and society.

Plant Crystals - Useful Materials or Extravagant Jewelry

Dr. Ezequiel Rivera

Illinois

9:00 - 10:15

10:30 - 11:45

Plants deposit a number of different products as crystals in their cells and tissues. Silicates, phosphates, calcites and oxalates have all been described in many different plants. Of these materials, oxalates are the most prevalent in flowering plants. Calcium oxalate has been implicated in defense against predators, as well as a means of controlling the availability of calcium for plant use. In situations where calcium can reach toxic levels, plants may use oxalic acid to precipitate it out. Soil acidity or akalinity affects the solubility of calcium and its availability as a nutrient for plants. It may be for this reason that plants have a system of controlling the calcium flux in their bodies which happens to be at the chemical level. People who eat considerable quantities of plants that have significant amounts of oxalates suffer a number of health-related problems. Most commonly, crystal "sand" may be found in urine. Kidney stones may result. Less common is a type of oxalosis in synovial fluid which can cause arthritis.

Dr. Ezequiel Rivera has a B.S. from Sul Ross State College, a M.S. from Purdue University, and Ph.D. from University of Texas-Austin. He has taught at University of Massachusetts-Lowell since 1974. During that time, he has been a guest professor at Mahidol University in Bangkok and at Universite Perpignan in France. Dr. Rivera has also worked at Purdue University, Notre Dame, and as a Biochemist in the U.S. Army. He is a member of Phi Kappa Phi, Alpha Chi, Botanical Society of America, American Society of Plant Physiology, Microscopy Society of America, Sigma Xi, New England Society of Microscopy. Dr. Rivera has published research on cell structure in plants and animals.

Robotic Systems for Exploring the Solar System

Dr. David Lavery

Kentucky
9:00 - 10:15
10:30 - 11:45

Dr. David Lavery will discuss NASA's space exploration program, current and future Mars missions, as well as other robotic and remote programs used to explore our solar system.

Dr. Lavery is responsible for the planning and implementation of robotic missions to explore the Solar System, and the implementation of the supporting technology development programs. He first came to NASA Headquarters in 1981 under contract with the Planning Research Corporation. He converted to the federal government in 1987, and received his assignment as Telerobotics Program Manager in 1991. His role was expanded in 1996 to include responsibilities for Mars exploration technologies and Solar System Exploration advanced mission studies.

While at NASA, Dr. Lavery has been a participant in the field party for the Mt. Erebus Explorer project, which deployed a robotic rover inside an active volcano in the Antarctic during the winter of 1992-93, and a field party member for the Dante II/ Mt. Spurr project which deployed a robotic rover inside an active volcano in the Alaska ranges in 1994. He was the program manager for the Sojourner planetary rover, which landed Mars on July 4, 1997 as part of the Mars Pathfinder mission. Dr. Lavery currently has responsibility for the Mars Exploration Rover-2003 project, which will send a pair of robotic rovers to the red planet in 2003 to explore the surface, and the Mars Express-NASA project, which is a joint mission with the European Space Agency to investigate the subsurface structure of Mars from an orbiting platform.

Adventures in Neutron Activation Analysis

Dr. Larry Robinson

Louisiana
9:00 - 10:15

Neutron activation analysis (NAA) is well recognized for its use in trace element analysis. Over the years numerous conferences and publications attest to the universal application of this methodology. Reactor based NAA which began at the Department of Energy's Graphite Reactor at Oak Ridge National Laboratory (ORNL) helped to bring NAA to "maturity." Nevertheless, variations in the technique continue to lead the some extremely interesting applications. In this presentation the speaker will discuss the fundamentals of NAA and it applications in various areas including environmental science, forensic science, non-proliferation, material science, and medical diagnosis.

Larry Robinson attended LeMoyne College and graduated summa cum laude from the University of Memphis with a B.S. degree in chemistry. He received a Ph.D. degree in nuclear chemistry from Washington University in St. Louis, Missouri. He served as a graduate research fellow at Los Alamos National Laboratory in 1983. At Oak Ridge National Laboratory (ORNL), his research included trace element analysis using neutron activation analysis and environmental radiochemistry. One of his more notable projects was the analysis of hair and nail samples from former president Zachary Taylor. Mr. Robinson is currently Director of the Environmental Sciences Institute at Florida A&M University (FAMU), where he has worked to win approval from the Florida Board of Regents for both B.S. and Ph.D. degree programs in environmental science at FAMU.

Robinson has been the recipient of numerous awards including: Martin-Marietta's Outstanding Community Service Award; the National Association of Black Chemists and Chemical Engineers' Outstanding Scientist Award; and the Oak Ridge Branch of the NAACP's Outstanding Service Award. He has also been involved in the Oak Ridge Community Housing Development Corporation, and the East Tennessee Chapter of the National Association of Black Chemists and Chemical Engineers.

Secret Lights in the Sea: Marine Bioluminescence

Dr. Edith Widder

Michigan
9:00 - 10:15
10:30 - 11:45

The open ocean environment represents the largest living space on our planet. The survival strategies for life in this realm are very different from those in the terrestrial world. On land bioluminescence is extremely rare, while in the oceans it's the rule rather than the exception. Come and see some of the bizarre and wonderful ocean creatures that use living light to help them survive. Today Dr. Widder will be providing us with a glimpse into her research into bioluminescence and into the dark depths of the ocean, where it turns out things are not so dark as we've been lead to believe.

Dr. Widder has been exploring the depths of the oceans using deep diving submersibles for 17 years. Much of her research has been directed at how light affects life in the depths – both dim sunlight filtering down from the surface and the light the animals themselves produce. She is a Senior Scientist in the Division of Marine Science at Harbor Branch Oceanographic Institution where she heads up the Bioluminescence Department. She is also an Adjunct Research Professor in the Department of Earth and Planetary Sciences at Johns Hopkins University, a Distinguished Scientist Adjunct at the Monterey Bay Aquarium Research Institute and Professor of Biological Sciences at the Florida Institute of Technology. Dr. Widder earned her Ph.D. (neurobiology) and M.Sc. (biochemistry) degrees from the University of California, Santa Barbara and her B.Sc. (biology) degree (magna cum laude) from Tufts University. Her research has involved the development of a number of instrument systems, including the HIDEX-BP (High Intake Defined Excitation Bathyphotometer) on which she co-holds the patent and which is now the standard in the U.S. Navy for measuring bioluminescence in the oceans.

Dr. Widder's research in bioluminescence has been featured in the Discovery Channel series "Dive to Forbidden Waters," which described research and diving with the Johnson-Sea-Link submersible in Cuban waters. She has recently produced a children's book on bioluminescence, *The Bioluminescence Coloring Book,* and an educational video, "Marine Bioluminescence: Secret Lights in the Sea."

What the Bones Tell Us: Forensic Genetic Analysis of Human Remains

Dr. Kevin Miller

Missouri

9:00 - 10:15

10:30 - 11:45

The successful investigation and prosecution of crimes requires, in most cases, the collection, preservation and forensic analysis of evidence. DNA analyses of body fluids, stains, and biological tissues recovered from evidence is often crucial to the demonstration of a person's guilt or innocence. In forensic DNA analysis, the DNA profiles of questioned biological samples are compared with the DNA profiles of known samples in order to associate victim(s) and/or suspects(s) with each other at a crime scene.

There are two types of DNA analyzed at the FBI laboratory - nuclear (nDNA) and mitochondrial (mtDNA). NDNA differs from mtDNA in its location, its sequence, its quantity in the cell, and its mode of inheritance. The nucleus of the cell contains two sets of 23 chromosomes - one paternal set and one maternal set. However, cells may contain hundreds of thousands of mitochondria, each of which may contain several copies of mtDNA. This seminar presents a general overview of forensic DNA typing with an emphasis on mtDNA analysis of human hair, bones, and teeth.

Dr. Kevin Miller earned his B.Sc. in Physiology at Cornell University, his M.Sc. in Pathophysiology at Virginia-Maryland Regional College of Veterinary Medicine, and his Ph.D. in Molecular Anthropology at the University of Cambridge. His Ph.D. research was on the topic of molecular genetic aspects of prehistoric human migration through the North Atlantic. Dr. Miller currently works at the FBI as a Forensic Examiner. Before that, he worked as a forensic consultant for North Louisiana Criminalistics Laboratory, Office of Coroner - Caddo Parish, LA, Office of Medical Examiner - Ventura County, CA, and various other state and federal agencies. He has been a court witness for homicide, human identification, serial homicide, and child abuse cases. While doing research at the University of California, he served as a lecturer and research mentor.

Searching for the Elusive Magnetic Lines of Force

Paul Thomas

Ohio
9:00 - 10:15
10:30 - 11:45

Take a mesmerizing journey of discovery into the fascinating realm of magnetic phenomena. Paul Thomas, better known at MIT as Mr. Magnet, will uncover before your eyes the secret forces of ferromagnetism and magneto-electricity. What mysterious force field holds steady an aluminum fry pan suspended in space? A magnetic impulse launches Garfield into space and with sudden forceful energy bends metal into a useful shape. Light up The White House by generating electric energy with your muscle power. How many watts can you generate? If you dare, discharge one million volts of electric potential holding a lightning rod in your bare hands. The Mr. Magnet show is just for the fun of it.

Paul Thomas is currently a Plasma Science and Fusion Center Technical Supervisor at MIT. After graduating from technical school, Mr. Thomas joined High Voltage Engineering Corporation, where he worked under the guidance of Robert J. Van de Graaff to develop high voltage apparatus for research. He pursued a degree in electrical engineering at Northeastern University. Mr. Thomas joined the Massachusetts Institute of Technology in 1983, where as part of a team of scientists and engineers, he supervised the integration of computer controls on a large-scale fusion experiment. Nine years later, Mr. Thomas began his educational outreach by building a series of demonstrations and bringing them in a van into Boston area schools. In the 8 years since the first school visit, Mr. Magnet has presented the program to nearly 300,000 students and teachers in the New England region. The show has also traveled to New Orleans, Atlanta, and Washington, D.C. for special events.

Hot Moons, Cold Comets, and a SHARP Way to Get to Space

Jim Nations

Oklahoma
9:00 - 10:15
10:30 - 11:45

Join Solar System Ambassador Jim Nations on an exciting trip to the outer solar system, a rendezvous with a comet and a new spaceship to reach low Earth orbit. The Galileo spacecraft has returned fascinating images of Jupiter and its moons. The most volcanically active body in the solar system (Io) and an ice-covered moon which may have life (Europa) remind us that the universe is stranger than we image. What's in store on future missions to the outer planets? Attend Comet Building 101 and learn how to make your own comet as we join the Stardust mission and those long-distance travelers that both build and kill worlds (dinosaurs not included). There's a new way of going into space called SHARP (Slender Hypervelocity Aerothermodynamic Research Probes) and it's under development in Wyoming? See how a small company in the Cowboy State is changing the way we go into space.

Jim Nations is Director of External Relations for Wickman Spacecraft and Propulsion Company (WSPC) located in Casper, Wyoming. He is director of The Rocket Camp, an exciting hands-on science/math/engineering/technology summer program instructing students in the design, manufacture and launching of solid-fuel amateur rockets. He also serves as chief technical assistant to WSPC's chief engineer on the SHARP contract.

Mr. Nations previously worked in NASA public affairs and education at Johnson Space Center, the Aerospace Education Services Program at Oklahoma State University and at the Jet Propulsion Laboratory. He is a JPL Solar System Ambassador and travels throughout the western United States conducting programs on JPL's solar system exploration activities. He currently holds an M. S. Space Studies and a B.A. Public Relations from the University of North Dakota and is taking a few years off from his doctoral studies.

Knots & Physics

Dr. Louis Kauffman

Washington
9:00 - 10:15
10:30 - 11:45

Knots as studied by mathematicians are an abstraction of the physical knots and weaves constructed, since antiquity, from rope and woven patterns of string and cloth. In studying the problem of topological classification of knots, one encounters new relationships of knots and physics that are quite beautiful and surprising. This talk will explain some of these relationships, starting with electricity and ending with quantum theory and general relativity!

Louis H. Kauffman is Professor of Mathematics at the University of Illinois at Chicago. He received his B.S. from MIT in 1966 and his Ph.D. from Princeton University in 1972. He has been on the faculty of the University of Illinois at Chicago since 1971, and has been a visiting professor at many universities and research institutions around the world. Professor Kauffman is the author of *On Knots* (Princeton University Press 1987), *Knots and Physics* (World Scientific Pub. Co. 1991, 1994, 2001) and numerous other books and research articles related to topology and knot theory. He is the founding editor of *The Journal of Knot Theory and Its Ramifications* (World Scientific), and editor of the *World Scientific Series on Knots and Everything*.

He is well-known for the discovery of state summation models for the Alexander-Conway and Jones polynomials, for a new knot polynomial called the Kauffman polynomial and for a generalization of knot theory called Virtual Knot Theory. He is particularly interested in the interface between knots and natural science.

Sequencing the Human Genome: Elucidating our Genetic Blueprint

Dr. Eric Green

Wisconsin
9:00 - 10:15

The human genome consists of 3 billion base pairs (bp) of DNA contained within 24 chromosomes that range in size from 50 to ~260 million base pairs. Encoded within this DNA are an estimated 25,000 to 75,000 genes and the necessary elements that control the regulation of their expression. Started in 1990, the Human Genome Project is a coordinated, international effort to map and sequence the human genome and, in parallel, that of several well-studied model organisms. The first phase of the Human Genome Project involved constructing relatively low-resolution maps of the human genome and refining the approaches for large-scale DNA sequencing. The second phase has focused on establishing the complete sequence of the human and other vertebrate genomes as well as beginning to decipher the encoded information in a systematic fashion. Earlier this year, a major milestone of the Human Genome Project was reported: the completion of a 'working draft' sequence for ~90% of the human genome. In essence, this reflects the acquisition of preliminary sequence data for virtually all of the readily clonable human DNA. This sequence will be refined (i.e., finished to high accuracy) over the next 2-3 years.

Eric Green received his M.D. and Ph.D. from Washington University School of Medicine (St. Louis, Missouri), studying the structure and biosynthesis of oligosaccharides on the pituitary glycoprotein hormones for his Ph.D. thesis work. During his residency training in clinical pathology, he worked in the laboratory of Maynard Olson, where he developed approaches for utilizing yeast artificial chromosomes to construct physical maps of DNA. Dr. Green is now Head of the Physical Mapping Section, Chief of the Genome Technology Branch, and Director of the NIH Intramural Sequencing Center (NISC) for National Human Genome Research Institute at the National Institutes of Health (Bethesda, Maryland). Dr. Green's research focuses on the mapping and sequencing of mammalian genomes and the isolation and characterization of genes causing genetic diseases.

Living Safely on a Dangerous Planet

Dr. Timothy Cohn

Idaho

10:30 - 11:45

We are paying a high price for the way we live on our beautiful but dangerous planet. In recent months the world experienced devastating earthquakes in El Salvador and India, as well as a powerful earthquake in Washington State. These came on the heels of earthquakes in Turkey, Taiwan, Colombia and Greece; floods and devastating landslides in Venezuela, Honduras and Nicaragua; hurricanes along the Atlantic Coast that forced evacuation of millions; and numerous smaller disasters. As bad as these events were, they were not extraordinary viewed in the context of the last century's disasters.

Science tells us that earthquakes, volcanoes and hurricanes have occurred throughout geologic time. In fact, the underlying physical processes are essential to how our planet works. However, the damage caused by the hazards - the natural disasters - has skyrocketed in recent decades, mostly because of how we choose to live and build on this active planet. Natural disasters, unlike natural hazards, are not inevitable.

Reducing our vulnerability to natural hazards requires understanding the natural processes that create them, but this alone will not solve the problem. Governments, the private sector, and individual citizens, must work together to develop and implement new approaches. Through such partnerships, science will help make our communities safer for everyone.

Tim Cohn works in the Office of the Director of the U.S. Geological Survey, where he serves as Science Advisor for Hazards and coordinates USGS programs that apply integrated science to the challenge of reducing the Nation’s vulnerability to natural hazards. In his previous position as a staff scientist at the USGS, Tim co-authored more than 25 papers on methods for estimating flood hazards and other topics. As the American Geophysical Union’s 1995-96 AAAS Congressional Science Fellow, he served as legislative assistant to Senator Bill Bradley on issues related to energy and the environment. Tim holds M.S. and Ph.D. degrees from Cornell University and a B.A. from Swarthmore College.

Embryo Preservation: Maintaining Germplasma Resources & Genetic Diversity

Dr. John Dobrinsky

Louisiana

10:30 - 11:45

With constant changing of global needs for improved quality of food and animal products, animal agriculture is being pressured to develop breeding strategies for maximizing genetic improvement while maintaining genetic diversity. Alternative methods are needed to produce, preserve and expand valuable genetic resources in a reasonable and economical manner. Banking of germplasm from desirable animals for unique genetic, production and disease resistance traits, as well as for biomedical uses, will facilitate acquisition and characterization of potentially useful germplasm, ensure genetic variation thru preservation of selected stocks, and facilitate utilization of useful germplasm in research and industry in the future.

John Dobrinsky is a Research Physiologist specializing in domestic animal embryology for the U.S. Department of Agriculture, Agricultural Research Service, in Beltsville, Maryland. His research program investigates maternal gamete and embryonic development and avenues for germplasm conservation, particularly in swine and cattle. His research has led to the development of four major breakthroughs in swine embryology, including the successful cryopreservation of swine embryos by cytoskeletal stabilization and vitrification in which he produced the first live offspring ever after warming and subsequent transfer of vitrified embryos. This work has culminated in an international patent application filed through the USDA Office of Technology Transfer. He just recently returned from a research sabbatical in the laboratory of Professor Ian Wilmut, Roslin Institute, Scotland, where he co-developed somatic cell nuclear transfer technology for production of cloned pigs. John was the 1998 USDA-ARS Herbert L. Rothbart Outstanding Early Career Research Scientist of the Year, winner of a 1998 United States Presidential Early Career Award for Scientists and Engineers, and was winner of the 2001 NE American Society of Animal Science Young Scientist Award. He received his Ph.D. from University of Massachusetts-Amherst, and both his M.S. and B.S. from University of Illinois-Urbana.

The Infinite Future

Dr. Ravi Athale

Wisconsin
10:30 - 11:45

Technology has given us an incredible and dazzling array of gadgets ranging from electronic toys, medical devices, communication devices, an on an on. As miraculous as these seem, this is just the beginning. In this presentation, you will learn about the future of technology and engineering while learning (1) how to predict the future and (2) participate in the creation of the next generation of marvels.

Dr. Athale received his B.Sc. (1972) from University of Bombay and M.Sc (1974) from Indian Institute of Technology, Kanpur, both is Physics. He finished his Ph.D. (1980) in Electrical Engineering from University of Calif., San Diego. He is currently an Associate Professor in the Electrical and Computer Engineering Department at George Mason University, in Fairfax, VA. His research at GMU has been in the area of optical computing and optical interconnections for high performance digital systems.

Dr. Athale was elected Fellow of the Optical Society of America in 1989 and he is a member, Lasers and Electro-Optics Society, IEEE. He chaired the first two topical meetings on Optical Computing in 1985 and 1987 and edited Critical Review of Technology volume on Digital Optical Computing, 1990 published by SPIE. In 1992 he founded in 1992, under DARPA sponsorship Consortium for Optical and Optoelectronic Technologies in Computing (CO-OP). He has also been a member of a team overseeing Joint Optoelectronics Project aimed at research collaboration between US and Japan in optical computing.

Dr. Athale has been issued several patents in optical processing and computing. He is a cofounder of HoloSpexTM, Inc. and co-inventor of HoloSpexTM glasses, the first consumer product that uses far field holograms. He is actively working on developing educational material based on HoloSpex glasses for K-12 students.